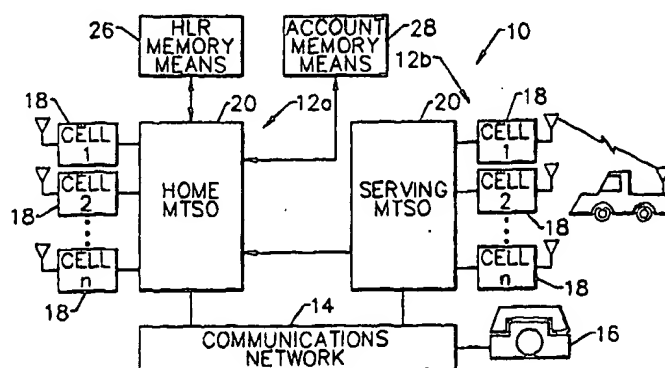




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(54) Title: WIRELESS COMMUNICATIONS SYSTEM AND METHOD OF OPERATION FOR REDUCING FRAUD



(57) Abstract

The wireless communications system includes a home carrier and HLR memory means, associated with the home carrier, for storing a number of Home Locator Records defining the level of service to be provided to the individual subscribers of the home carrier. The Home Locator Record is at least initially configured to prohibit call termination of the respective subscriber outside of the predetermined service area of the home carrier. However, the wireless communications system also includes reconfiguring means for at least temporarily reconfiguring the Home Locator Record of a respective subscriber in response to a request for communications service involving the subscriber who has roamed outside of the predetermined service area of the home carrier if the subscriber has prepaid for the requested services. Once reconfigured, the wireless communications system can provide the Home Locator Record of the respective subscriber to a serving carrier via IS-41 (Rev. A) messaging. The reconfigured Home Locator Record serves as the roaming subscriber's Visitor Locator Record which, in turn, authorizes the requested wireless communications service. Once the requested service has been ended, either upon completion of the call or exhaustion of the prepaid services, the reconfiguring means resets the Home Locator Record of the respective subscriber such that the Home Locator Record again prohibits call termination with the subscriber outside of the service area of the home carrier in order to further protect the wireless communications system from fraud.

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WIRELESS COMMUNICATIONS SYSTEM AND METHOD OF OPERATION FOR REDUCING FRAUD

BACKGROUND OF THE INVENTION

The use of wireless communications and, in particular, the use of cellular telephony as a means of personal communication is perceived by many as having experienced substantial, if not exponential growth in recent years. While growth and expansion in the use of cellular telephony for personal communication has been phenomenal in many respects, there still exists significant obstacles for expansion of its use to a large segment of the general population.

As in many emerging industries, the cellular telephony industry has been plagued and victimized by the relatively small segment of the public intent on defrauding the service providers or carriers. This relatively small segment of the public has found a variety of means for circumventing these existing safeguards. It is estimated that fraud by these "consumers" costs the cellular industry more than three million dollars per day.

As a result of the rampant growth of fraud in the cellular industry, carriers have been forced to adopt various techniques designed to reduce the opportunities for defrauding the carrier. An obvious method is to limit system access solely to those subscribers deemed highly creditworthy and to maintain

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listings of those former subscribers who have, in the past, defrauded the carriers. The primary problem with this approach is that it excludes the significantly larger segment of the general population comprised of otherwise trustworthy individuals desiring cellular services who fall short of the highly creditworthy standard. As a result, this approach severely restricts the potential opportunities for growth at a time when further growth is both desired, if not essential, to the expansion of the cellular telephony industry.

Efforts to reduce the relative exposure of the carrier in monetary terms to these unscrupulous practices have also been hindered by the veritable plethora of features and options now available to users of various forms of wireless communication including cellular telephony. Perhaps the most desired feature for the cellular subscriber is the ability to "roam" in areas which are not serviced by the home carrier. These features and options are virtually demanded by the consumer, but the liability associated with the utilization of these features are borne, at least initially, by the home carrier. The home carrier does not, however, retain control over the extent of the use of these features and options in all potential markets since access to a service and feature may be authorized in areas serviced by other carriers without the real time knowledge of the home carrier.

The inability to selectively control access to the various features available to users of wireless communication stems from the fundamental nature of the wireless communications industry and the basic fact that it relies on a network of different carriers in order to provide service of any meaningful geographic scope. Before providing local connectivity to a visiting cellular subscriber, a "remote" or serving carrier first verifies the creditworthiness of the

subscriber or, more aptly, verifies that the home carrier accepts financial responsibility for any fees incurred by its subscriber. In this regard, each cellular subscriber is identified by a combination of a discrete Mobile Identification Number (MIN) and a specific Electronic Serial Number (ESN) which are passed from the "remote" cellular carrier to the subscriber's home carrier by existing IS-41 (Rev. A) messaging protocols in response to a request for service by a subscriber roaming within the service area of the remote carrier. Based upon the MIN/ESN, the home carrier electronically verifies whether the cellular subscriber may have access to the requested services.

In particular, the home carrier maintains a Home Locator Record (HLR) associated with each subscriber which provides data relating to the particular subscriber, including data identifying those features and options available to the subscriber. In conventional cellular systems, the Home Locator Record is typically configured, in advance, by an operator and cannot be altered by the carrier during the verification process. Thereafter, upon request for wireless communications service involving a subscriber of the home carrier within the service area of a "remote" serving carrier, the home carrier transmits the subscriber's Home Locator Record to the serving carrier to create the subscriber's Visitor Locator Record (VLR) which defines the type and level of service to be provided to the roaming subscriber.

One method for reducing the exposure of a carrier to fraud would be to provide local, prepaid wireless communications services. In accordance with this approach, a carrier may integrate existing systems utilized for billing purposes, for example, to monitor the actual time used by the cellular subscriber and, when the subscriber is approaching the prepaid limit,

correspondingly restrict and/or terminate service, thereby limiting the carrier's relative exposure. The problem with this approach, however, is that the prepaid services must generally be limited to the geographic area served by the home carrier such that the cellular subscriber is not allowed to roam since the extent of usage outside of the home carrier's service area cannot be monitored or restricted.

While a wireless communications system can control call origination by populating the "HOTLINE" field of the subscriber's Visitor Locator Record (VLR) with the telephone number of a switching platform which, in turn, determines if the subscriber has paid in advance for the cellular service, the problems associated with call termination with a prepaid subscriber have not been addressed. In this regard, the problems associated with call termination with a prepaid subscriber are exacerbated in comparison to call origination because an incoming call for the subscriber may be placed directly to the roaming access port of the "remote" serving carrier.

There is, therefore, an existing need in the wireless communications industry and, in particular, in the cellular telephony industry for a wireless communications system and an associated method of operation which permits a carrier to limit its exposure to potential consumer fraud, while allowing subscribers to have access to the full range of features and options, including roaming and, more particularly, call termination with the subscriber while the subscriber is roaming.

SUMMARY OF THE INVENTION

The foregoing shortcomings in existing wireless communications systems are overcome in accordance with the present invention by temporarily reconfiguring the information maintained in the

subscriber's (otherwise permanent) Home Locator Record on a real-time basis in order to selectively permit call termination while the subscriber is roaming in foreign markets, i.e., service areas other than the home carrier's service area. However, the subscriber's Home Locator Record is only reconfigured in response to a request for wireless communications service if the subscriber has paid in advance for the requested service, such as roaming, and wishes to receive a call. During the course of a call, the amount of remaining prepaid services is monitored and the service is ended once the prepaid amount has been exhausted. Upon completion of the requested service, the subscriber's Home Locator Record is reset to again prohibit call termination, thereby further protecting the home carrier from fraud. For example, the home carrier is protected from subsequent attempts to contact a roaming subscriber via the roaming access port of the serving carrier since call termination is not allowed absent reconfiguring of the subscriber's Home Locator Record.

The wireless communications system of the present invention includes a home carrier and HLR memory means, associated with the home carrier, for storing a Home Locator Record database. The Home Locator Record database includes a number of Home Locator Records defining the service to be provided the subscribers of the home carrier. The Home Locator Record is at least initially configured to allow only hotline call origination and to prohibit call termination with the respective subscriber.

The wireless communications system also includes reconfiguring means for temporarily reconfiguring the Home Locator Record of a respective subscriber in response to a request for communications service involving the subscriber receiving an incoming call. For example, the request can be a request for call termination with a subscriber who has roamed

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outside of the service area of the home carrier. In response to this request, the reconfiguring means reconfigures the Home Locator Record of the respective subscriber to permit call termination if the subscriber
5 has paid in advance for the requested service.

In response to requests for wireless communications service involving a subscriber of the home carrier who has roamed outside of the service area of the home carrier, the wireless communications system
10 and method initially determines if the subscriber has paid in advance for the requested service. In this regard, the wireless communications systems can include account memory means for storing account information for the subscribers of the home carrier. This account
15 information can include information relating to the particular services, such as long distance and roaming, which have been paid in advance by respective ones of the subscribers. Upon determining that the subscriber has adequate funds in its account for the requested
20 service and a call is waiting to be delivered to the subscriber, the reconfiguring means at least temporarily reconfigures the Home Locator Record of the respective subscriber to permit call termination. The wireless communications system and method then provides
25 the reconfigured Home Locator Record of the respective subscriber to a serving carrier (typically via IS-41 (Rev. A) messaging) which, in turn, provides the requested wireless communications service.

During the provision of the requested service
30 by the serving carrier, the wireless communications system and method monitors the account memory means and ends the requested service once the account information for the respective subscriber indicates that the services which had been paid in advance by the
35 subscriber have been exhausted. Once the requested service has been ended, either upon completion of the call or exhaustion of the prepaid services, the

reconfiguring means resets the Home Locator Record of the respective subscriber such that the Home Locator Record again prohibits call termination with the subscriber. As a result, the wireless communications system is further protected from fraud since calls to the roaming subscriber via the roaming access port of the serving carrier will not be connected since the Home Locator Record of the respective subscriber has been reset to again prohibit call termination with the subscriber.

In this manner, a particular subscriber may have access on a discrete transaction-by-transaction basis to features of the wireless communications system which are considered generally desirable, such as call termination with a roaming subscriber. Meanwhile, the home carrier may substantially limit its relative exposure to the illicit practices of the relatively small segment of the potential consuming market for wireless communications services. Accordingly, carriers can increase the universe of potential subscribers to include consumers who are slightly less creditworthy since the relative exposure of the carrier is limited according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other advantages and features of the invention, and the manner in which the same are accomplished, will become more readily apparent upon consideration of the following detailed description of the invention taken in conjunction with the accompanying drawings, which illustrate preferred and exemplary embodiments, and wherein:

Figure 1 is a schematic block diagram illustrating the basic components of a wireless communications system according to the present invention, including a home carrier having HLR memory means and account memory means associated therewith;

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Figure 2 is a schematic block diagram of a wireless communications switching platform according to one embodiment of the present invention;

Figure 3 is a schematic block diagram
5 illustrating the various communications links within a wireless communications system according to another embodiment of the present invention; and

Figure 4 is a flow chart illustrating the operations performed by a wireless communications
10 system and method according to one embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which a preferred embodiment
15 of the invention is shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, this embodiment is provided so that this disclosure will be thorough and complete and
20 will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

Referring now to Figure 1, a wireless communications system 10 according to one embodiment of
25 the present invention is illustrated. While this communications system will be primarily described hereinbelow in conjunction with a cellular telephony system, the wireless communications system can include any cellular or digital communications system, such as
30 an AMPS cellular system, a digital cellular system or a Personal Communications System, without departing from the spirit and scope of the present invention.

The wireless communications system 10 typically includes a plurality of carriers 12 for
35 providing wireless communications service within respective predetermined service areas. The carriers

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are generally connected with a communications network 14, such as an associated public switched telephone network which, in turn, is associated and in communication with one or more terminals, such as the land line telephone terminal 16 illustrated in Figure 1. For a cellular telephony system, for example, a duplex communications link may be effected between two cellular terminals, or between a cellular terminal and a land line telephone terminal.

Each carrier 12 provides wireless communications service to a number of subscribers within the predetermined service area of the carrier. A particular subscriber will therefore have a home carrier 12a with which the subscriber has contracted for wireless communications service, and a number of "remote" carriers having different service areas which may function as serving carriers 12b in instances in which the subscriber is roaming outside of the service area of the home carrier, but with the service area of a respective serving carrier. For a cellular communications system, the service area of a cellular carrier is divided into a number of cells 18 designated Cell 1, Cell 2, ..., Cell n in Figure 1. In addition to the radio base stations and the associated antennas within each respective cell, a carrier includes a mobile telephone switching office (MTSO) 20 which serves as the central coordinating element for all cells and which typically includes a processor 22, such as a computer-based account processor, and a telephony switch 24. The MTSO also generally interfaces with the telephone company zone offices, controls call processing and handles billing activities.

According to the present invention, the home carrier 12a is associated with both HLR memory means 26 and account memory means 28. The HLR memory means and/or the account memory means may form a portion of the home carrier's MTSO 20. Alternatively, the HLR

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memory means and/or the account memory means may be external to, but in communication with the home carrier's MTSO as shown in Figures 1 and 2.

5 The HLR memory means 26 typically includes a memory device for storing a Home Locator Record database. The Home Locator Record database includes a number of Home Locator Records defining the wireless communications service to be provided to respective subscribers of the home carrier 12a. For example, the
10 Home Locator Record of a respective subscriber defines the features and options which the subscriber has selected. One feature of the many features defined by a subscriber's Home Locator Record is call termination which indicates whether the subscriber is allowed to
15 receive calls, including calls received while the subscriber roams outside of the predetermined service area of the home carrier.

The account memory means 28 also typically includes a memory device for storing account
20 information for each of the subscribers of the home carrier 12a. According to the present invention, the subscribers can pay in advance for selected wireless communications services. For example, subscribers can pay in advance for a full featured wireless
25 communications system 10 that controls all facets of wireless communications regardless of the subscriber's location, i.e., at home or while roaming, in a manner which removing the liability of the home carrier.

As shown in Figure 2, the MTSO 20 of the home
30 carrier 12a has been specifically developed as a switching platform for providing wireless communications service to a number of subscribers, while protecting the home carrier from fraud. As shown in Figure 2, the switching platform of the present
35 invention includes reconfiguring means 30 for at least temporarily reconfiguring the Home Locator Record of a respective subscriber in response to a request for

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wireless communications service involving the subscriber outside the predetermined service area of the home carrier. For example, this request may be an incoming call requesting call termination with the respective subscriber outside of the predetermined service area of the home carrier.

As explained below, the reconfiguring means 30 is responsive to the account memory means 28 so as to only reconfigure the Home Locator Record of the respective subscriber if the stored account information indicates that the subscriber has paid an advance for the requested wireless communications service. If the subscriber has paid an advance for the requested wireless communications service, the reconfiguring means will temporarily reconfigure the Home Locator Record of the respective subscriber to permit the requested feature, i.e., call termination, while the subscriber roams outside of the service area of the home carrier 12a. While the reconfiguring means will hereinafter be described in conjunction with the reconfiguring of a Home Locator Record to permit call termination, including call termination outside of the predetermined service area of the home carrier, the reconfiguring means may reconfigure the Home Locator Record to selectively permit the subscriber to temporarily utilize other features while the subscriber roams outside of the predetermined service area of the home carrier.

Upon completion of the requested wireless communications service, the reconfiguring means 30 resets the Home Locator Record of the respective subscriber to again prohibit the requested feature, such as to prohibit call termination with the subscriber outside the predetermined service area of the home carrier 12a. As described below, the switching platform 20 of the present invention therefore reduces, if not prevents, fraud by only

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permitting call termination while roaming outside of the predetermined service area of the home carrier in specific instances in which the subscriber has paid in advance.

5 As also shown in Figure 2, the switching platform 20 can include monitor means 32 for monitoring the account memory means 28 while the switching platform provides the requested wireless communications service. In instances in which a subscriber's Home
10 Locator Record has been temporarily reconfigured to permit call termination, the monitor means can continue to monitor the account information relating to the wireless communications services which have been paid
15 in advance by the respective subscriber while the subscriber roams outside of the predetermined service area of the home carrier 12a. In this regard, once the subscriber begins to use the prepaid wireless
communications services, the account information for the respective subscriber is modified, preferably in
20 real time by the processor 22, in order to accurately reflect the remaining prepaid services available for the respective subscriber.

 The switching platform 20 also preferably includes call duration control 34 for ending the
25 requested wireless communications service. Once the account information indicates that all of the wireless communications services which had been paid in advance by the respective subscriber have been exhausted, the monitor means 22 notifies the call duration control
30 means. The call duration control means then ends the wireless communications service, such as by disconnecting the subscriber's telephone call.

 As described above, the switching platform 20 also includes a switch 24, such as a telephony switch,
35 and a processor 22, such as a computer-based account processor. As shown in Figure 2, the processor can include the reconfiguring means 30, the monitor means

32 and the call duration control means 34. However, the reconfiguring means, the monitor means and/or the call duration control means of one advantageous embodiment are embodied by a combination of hardware, such as the processor, and software, such as a computer program product. The computer program product of this advantageous embodiment includes a computer-readable storage medium having computer-readable program code means, such as a series of computer instructions, embodied in the computer-readable storage medium for selectively reconfiguring the Home Locator Records of respective ones of the subscribers, for monitoring the account memory means and/or for selectively ending the wireless communications service of respective ones of the subscribers.

In this regard, Figures 1-4 are block diagram, flow chart and control flow illustrations of methods, systems and program products according to the invention. It will be understood that each block or step of the block diagram, flow chart and control flow illustrations, and combinations of blocks in the block diagram, flow chart and control flow illustrations, can be implemented by computer program instructions. These computer program instructions may be loaded onto a computer or other programmable apparatus to produce a machine, such that the instructions which execute on the computer or other programmable apparatus create means for implementing the functions specified in the block diagram, flow chart or control flow block(s) or step(s). These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means which implement the function specified in the block diagram, flow chart or control flow block(s) or

step(s). The computer program instructions may also be loaded onto a computer or other programmable apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to
5 produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the block diagram, flow chart or control flow block(s) or step(s).

10 Accordingly, blocks or steps of the block diagram, flow chart or control flow illustrations support combinations of means for performing the specified functions, combinations of steps for performing the specified functions and program
15 instruction means for performing the specified functions. It will also be understood that each block or step of the block diagram, flow chart or control flow illustrations, and combinations of blocks or steps in the block diagram, flow chart or control flow
20 illustrations, can be implemented by special purpose hardware-based computer systems which perform the specified functions or steps, or combinations of special purpose hardware and computer instructions.

The operations of the wireless communications
25 system 10 of the present invention will now be described primarily in conjunction with the flow chart of Figure 4. As shown in block 50, the wireless communications system initially receives a request for wireless communications service involving the
30 subscriber outside of the predetermined service area of the home carrier 12a of the subscriber. For example, the switching platform 20 of the present invention and, more particularly, the switch 24 may receive a call for a subscriber who is presently in a region serviced by
35 another carrier, i.e., the serving carrier 12b. In one embodiment, each subscriber of the wireless communications system of the present invention is

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assigned a unique telephone number, such as a unique toll-free number or a common toll-free number with a unique personal identification number (PIN). Upon receiving a call to the telephone number assigned to a
5 respective subscriber, the switching platform initially identifies the mobile identification number (MIN) and Electronic Serial Number (ESN) of the subscriber based upon the subscriber's unique toll-free number or the subscriber's unique PIN.

10 Thereafter, the switching platform 20 and, more particularly, the monitor means 32 determines if the subscriber has paid in advance for the requested wireless communications service, such as for roaming or, more particularly, for call termination while the
15 subscriber is roaming. See block 52. If the account information for the respective subscriber indicates that the subscriber has not paid for any services in advance which have not been previously used or exhausted, the switching platform provides a message to
20 the caller, such as "the cellular phone that you have dialed is temporarily out of service", prior to disconnecting. See block 54. If the subscriber has paid in advance for the requested wireless communications service, however, the switching platform
25 determines if the subscriber is currently on another call. See block 56. If so, the switching platform preferably transfers the incoming call to voice-mail such that the caller can leave a message for the subscriber as shown in block 58.

30 If the subscriber has paid in advance for the requested wireless communications service and the subscriber is not on another call, the switching platform 20 and, more particularly, the reconfiguring means 30 temporarily reconfigures the Home Locator
35 Record of the respective subscriber to permit call termination such that the request for call termination with the subscriber who is presently outside of the

service area of the home carrier 12a can be accommodated, i.e., the call can be completed. See block 60. Once the Home Locator Record of the respective subscriber has been reconfigured, the
5 serving carrier 12b is petitioned for a temporary local dial number (TLDN). See block 62. In the embodiment illustrated in Figure 1, the switching platform of the present invention may petition the serving carrier, such as via switch-to-switch communications (SS-7), for
10 a TLDN. In the embodiment illustrated in Figure 3, however, the HLR memory means 26 is one component of an HLR node 36 which is adapted to communicate with both the switching platform, i.e., the home MTSO, and the serving carrier, i.e., the serving MTSO. In this
15 embodiment, the home carrier can issue an intracarrier petition to the serving carrier, via the HLR node, for a TLDN once the Home Locator Record of the respective subscriber has been reconfigured.

In either embodiment and in response to the
20 home carrier's request for a TLDN, the serving carrier 12b requests a Visitor Locator Record from the home carrier 12a. As described above, a subscriber's Visitor Locator Record is based upon the current Home Locator Record of the respective subscriber.
25 Accordingly, the wireless communications system 10 of the present invention reconfigures the Home Locator Record of the respective subscriber before sending the subscriber's current Visitor Locator Record to the serving carrier, either via the switching platform 20
30 or via the HLR node 36, to thereby create or update the subscriber's Visitor Locator Record which is maintained by the serving carrier. See block 64. Since the reconfigured Home Locator Record now permits call
35 termination with the respective subscriber, the serving carrier then provides the switching platform with a TLDN. See block 66. For example, the serving carrier can provide the switching platform with a TLDN for the

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respective subscriber via switch-to-switch communications as shown in Figure 1 or via intracarrier signals, such as the HLR node, as shown in Figure 3. Upon receipt of the TLDN, the switching platform and,
5 more particularly, the switch 24 dials with TLDN to deliver the incoming call. See block 68.

Following call delivery and during the period of time in which the subscriber's phone remains off-hook, the account information within the account memory
10 means 28 which relates to the respective subscriber is modified to effectively decrease the amount of remaining wireless communications services which have been prepaid by the subscriber and which remain to be provided to the subscriber. See block 70. For
15 example, the processor 22 may repeatedly decrement the prepaid time remaining for the respective subscriber as the subscriber's phone remains off-hook.

As shown in block 78, the switching platform
20 also repeatedly determines if the subscriber has completed the telephone call, such as by placing the phone on-hook or by otherwise signing off. If the switching platform determines that the telephone call has not been completed, the switching platform 20 and, more particularly, the monitor means 32 continues to
25 monitor the account information for the respective subscriber to determine if the subscriber has prepaid for and is entitled to additional wireless communications service. See block 72. If the account information for the respective subscriber indicates
30 that the subscriber has exhausted all of their prepaid services, the monitor means notifies the call duration control means 34 which, in turn, ends the service, i.e., disconnects the telephone call. See block 80. If the account information for the respective
35 subscriber indicates that the subscriber is entitled to additional service, however, the monitor means then determines if the wireless communications services

which have been prepaid by the subscriber and which remain to be provided are small, such as less than ten minutes. See block 74. If so, the switching platform can announce the time remaining to the subscriber such that the subscriber can plan to complete the telephone call within the remaining time. See block 76. Otherwise, this monitoring process can continue as shown in Figure 4.

If the call has ended, either by action of the respective subscriber or by the call duration control means 34 upon exhaustion of the prepaid services, the switching platform 20 and, more particularly, the reconfiguring means 30 will reset the Home Locator Record of the subscriber so as to prohibit call termination, prior to releasing the telephone call. See blocks 82 and 84. By resetting the Home Locator Record of the subscriber to prohibit call termination, the wireless communications system 10 of the present invention reduces, if not prevents fraud by not allowing unauthorized access to any subscriber. In particular, subsequent telephone calls to the roaming access port of the serving carrier 12b which request call termination with a roaming subscriber of the home carrier 12a will not be completed since the Home Locator Record of the respective subscriber which is provided to the serving carrier would again indicate that the subscriber is prohibited from receiving calls. Accordingly, the wireless communications system and method of the present invention permit call termination with a roaming subscriber on a limited, prepaid basis, while reducing, if not preventing, fraud upon the home/serving carrier. As a result, carriers can increase the universe of potential subscribers to include consumers who are slightly less creditworthy since the relative exposure of the carrier is limited according to the present invention.

In the drawings and the specification, there has been set forth a preferred embodiment of the invention and, although specific terms are employed, the terms are used in a generic and descriptive sense only and not for purpose of limitation, the scope of the invention being set forth in the following claims.

THAT WHICH IS CLAIMED IS:

1. A wireless communications system comprising:

a home carrier for providing wireless communications service to a subscriber within a predetermined service area;

HLR memory means, associated with said home carrier, for storing a home locator record database comprising a plurality of home locator records at least partially defining the wireless communications service to be provided to respective ones of the subscribers of said home carrier, wherein the home locator record is at least initially configured to prohibit call termination with the respective subscriber; and

reconfiguring means for at least temporarily reconfiguring the home locator record of a respective subscriber in response to a request for wireless communications service involving the subscriber to permit call termination with the subscriber if the subscriber has paid in advance for the requested wireless communications service.

2. A wireless communications system according to Claim 1 wherein the request for wireless communications service is a request for call termination with the respective subscriber outside of the predetermined service area of said home carrier, and wherein said reconfiguring means at least temporarily reconfigures the home locator record of the subscriber so as to permit call termination with the subscriber if the subscriber has paid in advance for wireless communications service with said home carrier.

3. A wireless communications system according to Claim 1 further comprising a serving

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carrier for providing wireless communications service within a predetermined service area which is at least partially different than the predetermined service area of said home carrier, wherein said serving carrier cooperates with said home carrier for providing the requested wireless communications service if said reconfiguring means has reconfigured the home locator record of the respective subscriber to permit call termination.

4. A wireless communications system according to Claim 1 wherein said reconfiguring means resets the home locator record of the respective subscriber upon completion of the requested wireless communications service such that the home locator record again prohibits call termination with the subscriber.

5. A wireless communications system according to Claim 1 further comprising account memory means, associated with said home carrier, for storing account information for the plurality of subscribers of said home carrier including account information relating to the wireless communications services which have been paid in advance by respective ones of the subscribers.

6. A wireless communications system according to Claim 5 further comprising monitor means for monitoring said account memory means while said home carrier provides the requested wireless communications service.

7. A wireless communications system according to Claim 6 further comprising call duration control means for ending the requested wireless communications service once the account information for

5 the respective subscriber indicates that the wireless communications services which had been paid in advance by the subscriber have been exhausted.

8. A wireless communications switching platform for selectively providing wireless communications service to a plurality of subscribers, wherein the wireless communications service to be
5 provided to a respective subscriber is at least partially defined by a home locator record which is at least initially configured to prohibit call termination with the subscriber outside of a predetermined service area, and wherein the wireless communications switching
10 platform comprises:

account memory means for storing account information for the plurality of subscribers; and
reconfiguring means, responsive to said
account memory means, for at least temporarily
15 reconfiguring the home locator record of a respective subscriber in response to a request for wireless communications service involving the subscriber outside of the predetermined service area to permit call
termination with the subscriber if the stored account
20 information indicates that the subscriber has paid in advance for the requested wireless communications service.

9. A wireless communications switching platform according to Claim 8 further comprising a switch for providing the requested wireless communications service if the home locator record
5 permits call termination with the respective subscriber.

10. A wireless communications switching platform according to Claim 8 wherein said reconfiguring means resets the home locator record of

the respective subscriber upon completion of the
5 requested wireless communications service such that the
home locator record again prohibits call termination
with the subscriber outside of the predetermined
service area.

11. A wireless communications switching
platform according to Claim 8 wherein said account
memory means includes account information relating to
the wireless communications services which have been
5 paid in advance by respective ones of the subscribers.

12. A wireless communications switching
platform according to Claim 11 further comprising
monitor means for monitoring said account memory means
while the wireless communications switching platform
5 provides the requested wireless communications service.

13. A wireless communications switching
platform according to Claim 12 further comprising call
duration control means for terminating the requested
wireless communications service once the account
5 information for the respective subscriber indicates
that the wireless communications services which had
been paid in advance by the subscriber have been
exhausted.

14. A method of selectively providing
wireless communications service to a plurality of
subscribers, wherein the wireless communications
service to be provided to a respective subscriber is at
5 least partially defined by a home locator record which
is at least initially configured to prohibit call
termination with the subscriber, and wherein the method
comprises the steps of:

receiving a request for wireless
10 communications service including call termination with

the subscriber outside of a first predetermined service area;

15 determining if the subscriber has paid in advance for the requested wireless communications service;

20 at least temporarily reconfiguring the home locator record of the subscriber to permit call termination with the subscriber if the subscriber has paid in advance for the requested wireless communications service; and

providing the requested wireless communications service if the home locator record is reconfigured to permit call termination with the subscriber.

5 15. A method according to Claim 14 wherein said providing step comprises providing the reconfigured home locator record of the subscriber to a serving carrier which provides the requested wireless communications service, wherein the serving carrier provides wireless communications service within a second predetermined service area which is at least partially different than the first predetermined service area.

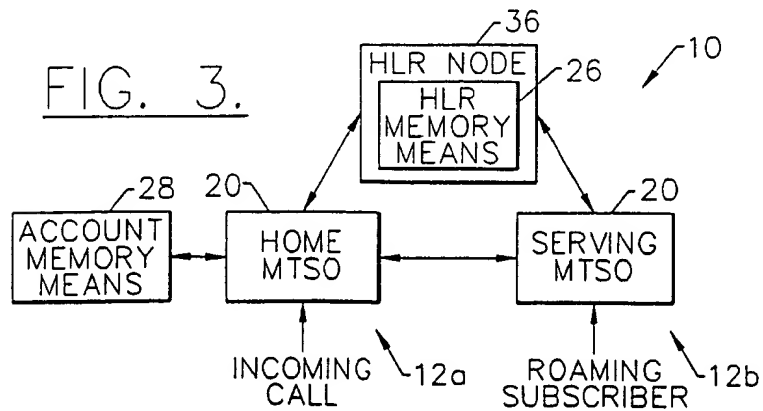
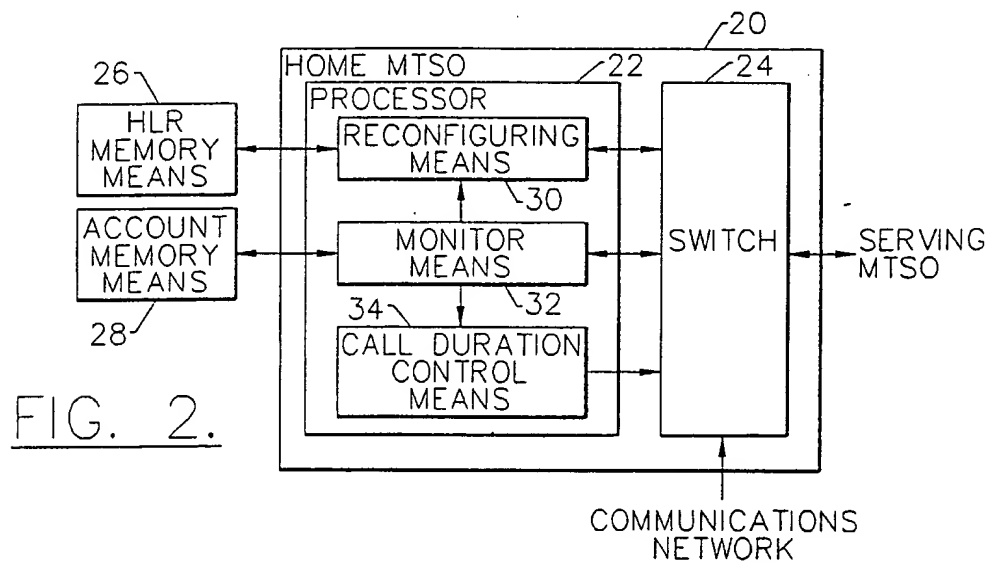
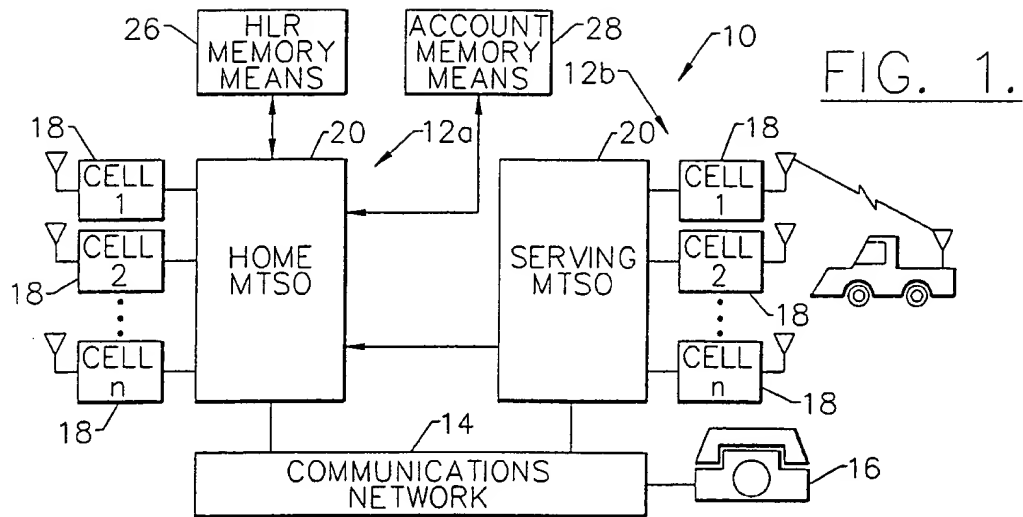
5 16. A method according to Claim 14 further comprising the step of resetting the home locator record of the respective subscriber upon completion of the requested wireless communications service such that the home locator record again prohibits call termination with the subscriber outside of the predetermined service area.

17. A method according to Claim 14 further comprising repeatedly determining, during said providing step, if the subscriber has paid in advance

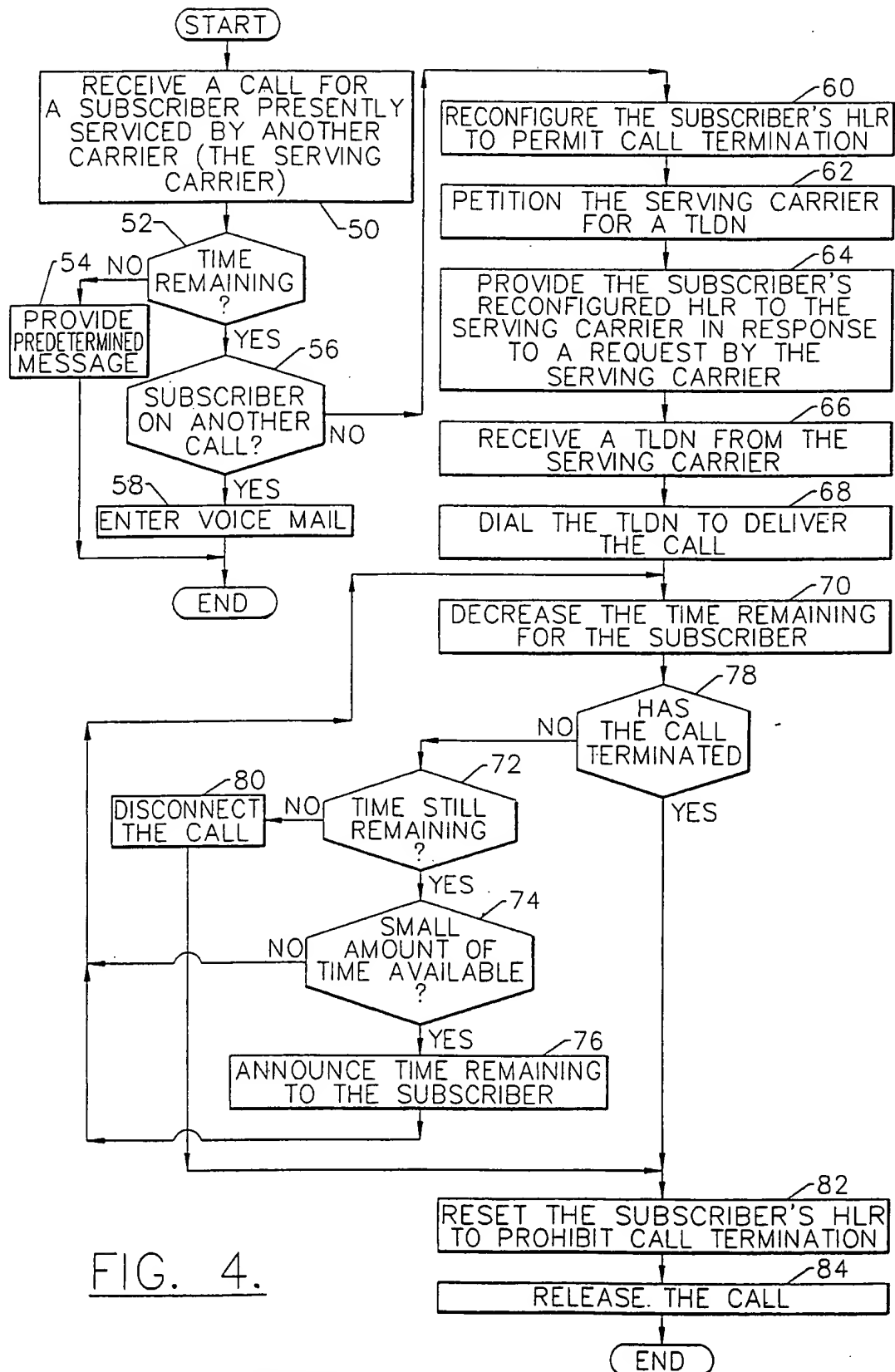
for a continuation of the provided wireless
5 communications service.

18. A method according to Claim 17 further
comprising terminating the requested wireless
communications service upon determining that the
wireless communications services which had been paid in
5 advance by the subscriber have been exhausted.

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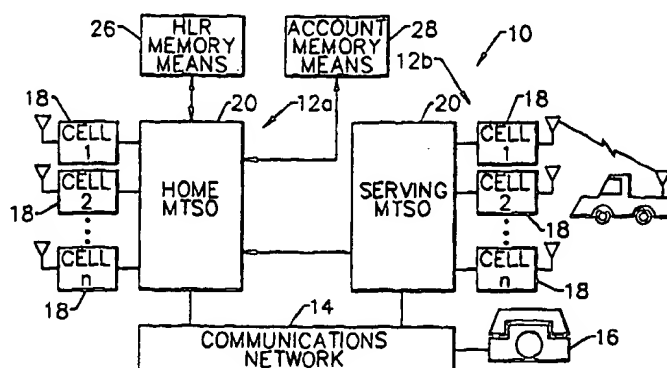




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(21) International Application Number: PCT/US98/01758 (22) International Filing Date: 30 January 1998 (30.01.98) (30) Priority Data: 08/791,860 31 January 1997 (31.01.97) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 08/791,860 (CON) Filed on 31 January 1997 (31.01.97) (71) Applicant (for all designated States except US): USA TELECOMMUNICATIONS SERVICES, INC. [US/US]; 1348-100 Matthews Township Parkway, Matthews, NC 28105 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): MORGAN, Joseph, LaMance [US/US]; 901-103 Summit Walk Drive, Char- lotte, NC 28270 (US). (74) Agents: COCHRAN, David, B. et al.; Jones, Day, Reavis & Pogue, North Point - 901 Lakeside Avenue, Cleveland, OH 44114-1190 (US).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. (88) Date of publication of the international search report: 11 February 1999 (11.02.99)	

(54) Title: WIRELESS COMMUNICATIONS SYSTEM AND METHOD OF OPERATION FOR REDUCING FRAUD



(57) Abstract

The wireless communications system includes a home carrier and HLR memory means, associated with the home carrier, for storing a number of Home Locator Records defining the level of service to be provided to the individual subscribers of the home carrier. The Home Locator Record is at least initially configured to prohibit call termination of the respective subscriber outside of the predetermined service area of the home carrier. However, the wireless communications system also includes reconfiguring means for at least temporarily reconfiguring the Home Locator Record of a respective subscriber in response to a request for communications service involving the subscriber who has roamed outside of the predetermined service area of the home carrier if the subscriber has prepaid for the requested services. Once reconfigured, the wireless communications system can provide the Home Locator Record of the respective subscriber to a serving carrier via IS-41 (Rev. A) messaging. The reconfigured Home Locator Record serves as the roaming subscriber's Visitor Locator Record which, in turn, authorizes the requested wireless communications service. Once the requested service has been ended, either upon completion of the call or exhaustion of the prepaid services, the reconfiguring means resets the Home Locator Record of the respective subscriber such that the Home Locator Record again prohibits call termination with the subscriber outside of the service area of the home carrier in order to further protect the wireless communications system from fraud.

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INTERNATIONAL SEARCH REPORT

International Application No
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B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 H04Q H04M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 36192 A (NOKIA OY AB ;BEHRUZ VAZVAN (FI)) 14 November 1996 see abstract see page 2, line 33 - page 5, line 13 see page 6, line 9 - page 14, line 30 see figures 2-3E ---	1-18
A	EP 0 698 987 A (ALCATEL NV) 28 February 1996 see abstract see the whole document ---	1-18
A	GB 2 280 085 A (VODAFONE LTD) 18 January 1995 see abstract see page 1, line 21 - page 8, line 2 see page 8, line 24 - page 31, line 6 --- -/--	1-18
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Date of the actual completion of the international search <div style="text-align: center;">1 December 1998</div>		Date of mailing of the international search report <div style="text-align: center;">18/12/1998</div>
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International Application No
PCT/US 98/01758

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>WO 92 22174 A (TELENOKIA OY) 10 December 1992 see abstract see page 3, line 28 - page 5, line 8 see page 6, line 25 - page 12, line 9 see figures 2-4 -----</p>	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01758

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9636192 A	14-11-1996	FI 952212 A AU 5650396 A	09-11-1996 29-11-1996
EP 0698987 A	28-02-1996	ZA 9506867 A	22-03-1996
GB 2280085 A	18-01-1995	AU 6978494 A WO 9501069 A	17-01-1995 05-01-1995
WO 9222174 A	10-12-1992	FI 87963 B AT 144672 T AU 651466 B AU 1914192 A DE 69214772 D DE 69214772 T EP 0542963 A JP 6500683 T US 5400390 A	30-11-1992 15-11-1996 21-07-1994 08-01-1993 28-11-1996 03-04-1997 26-05-1993 20-01-1994 21-03-1995